Figure 1

Figure 2

Figure 3
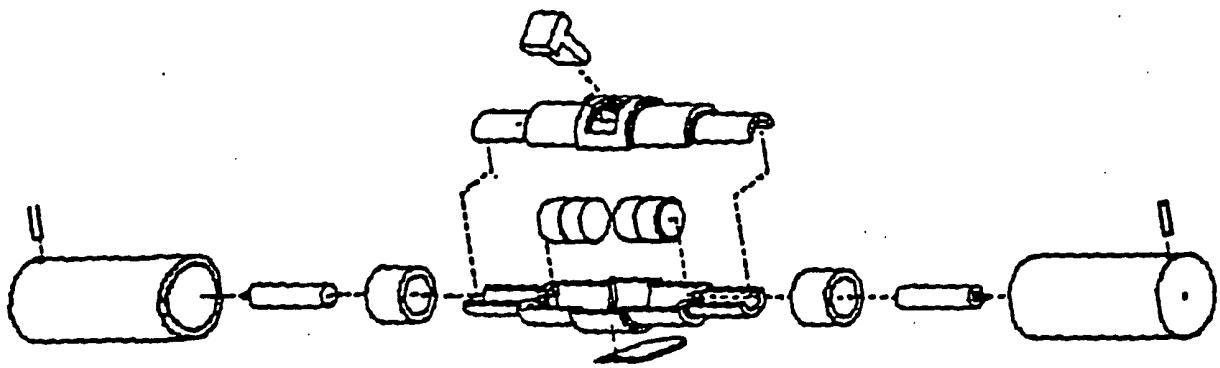

Figure 4
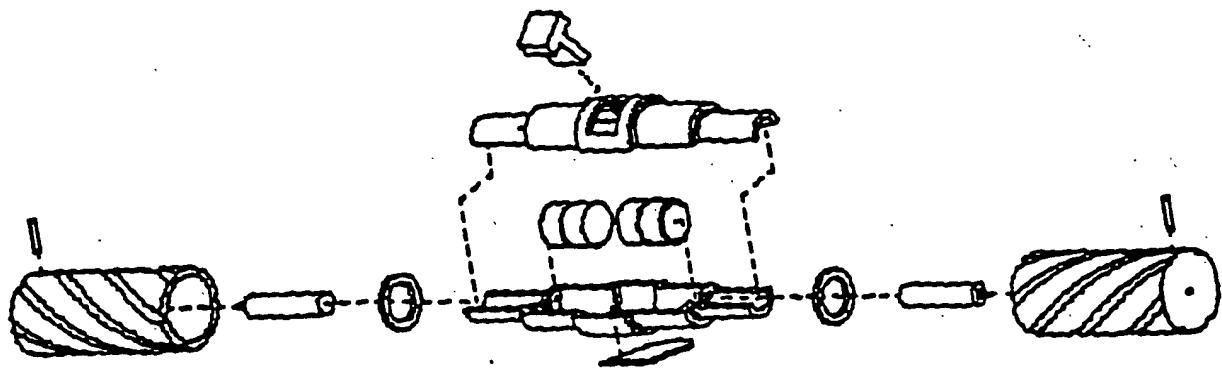
Figure 5
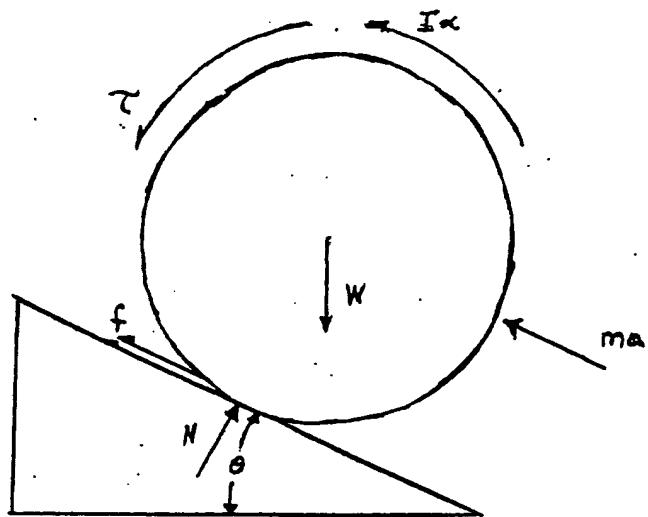
Figure 6
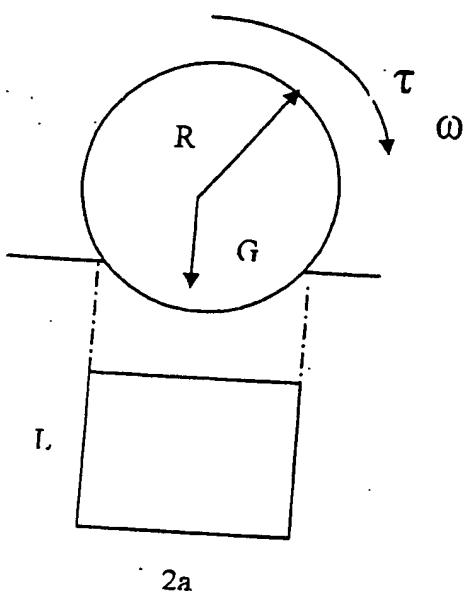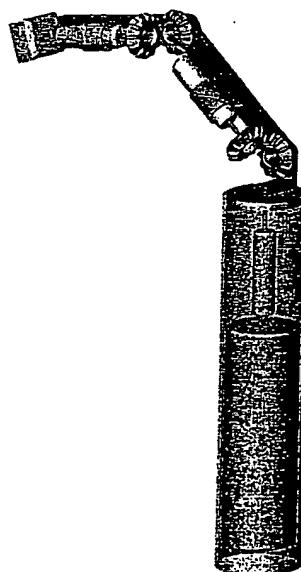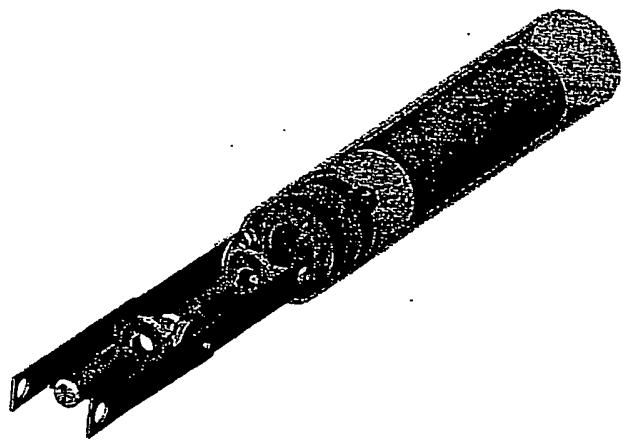
Figure 7

Figure 8

Figure 9
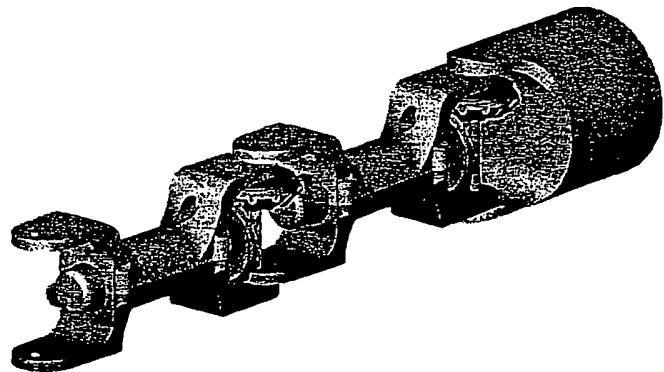
Figure 10
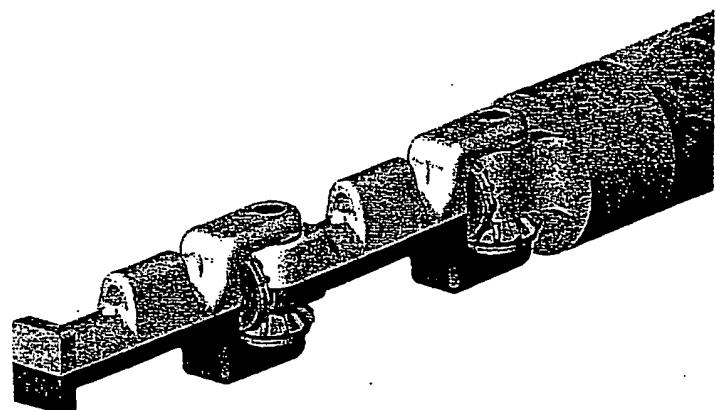
Figure 11
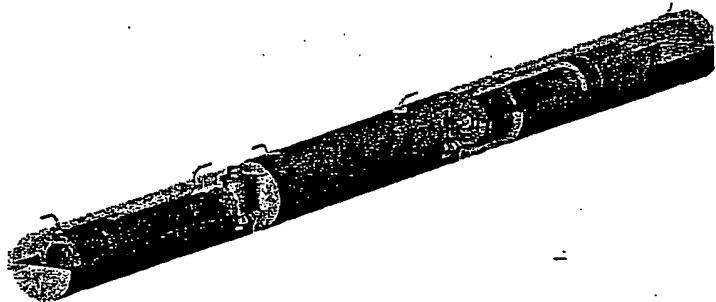
Figure 12
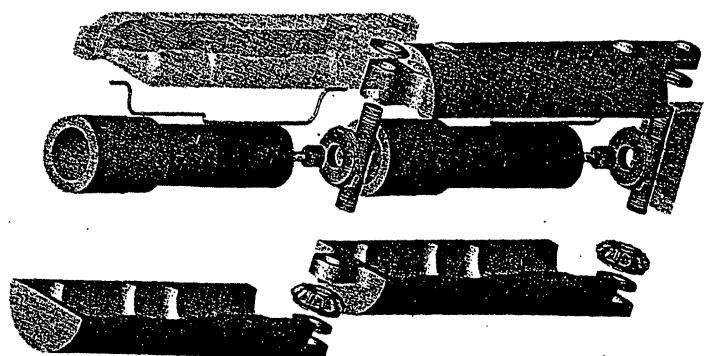
Figure 13
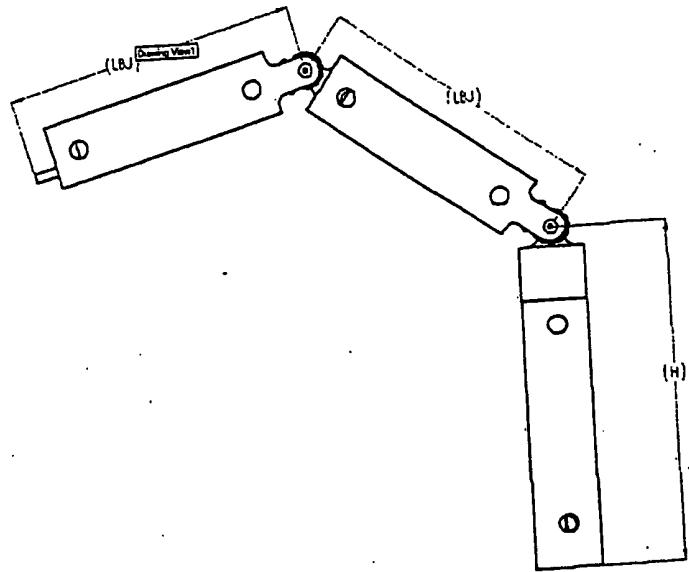
Figure 14
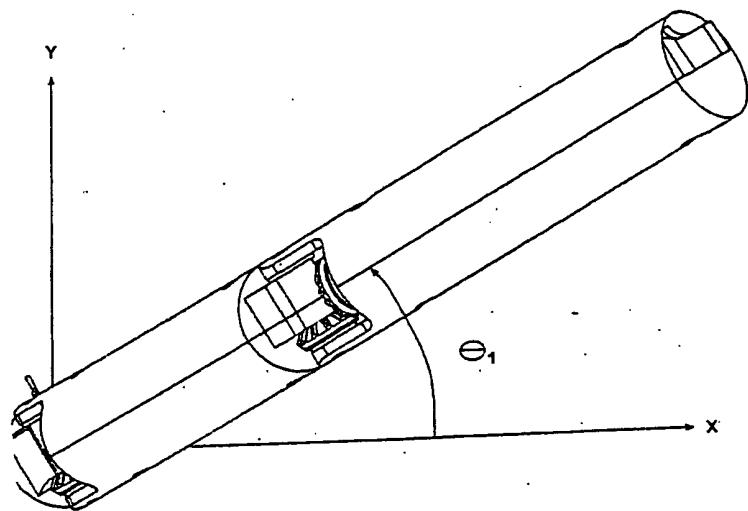
Figure 15

Figure 16

Figure 17

```
   ┌─────────────┐
   │ Pentium PC  │
──▶│ w/PCI-DSP   │
   └─────────────┘
          │  Motor Drive Signals
          ▼
   ┌─────────────┐
   │Shift and Scale│
   │ DSP Output  │
   └─────────────┘
          │
          ▼
   ┌─────────────┐     ┌─────────────┐
   │ Analog to   │     │   Motor     │
   │    PWM      │────▶│   Driver    │
   │ conversion  │     │  Circuitry  │
   └─────────────┘     └─────────────┘
                              │
                              ▼
   Encoder Feedback    ┌─────────────┐
                       │   Motors    │
                       └─────────────┘
```
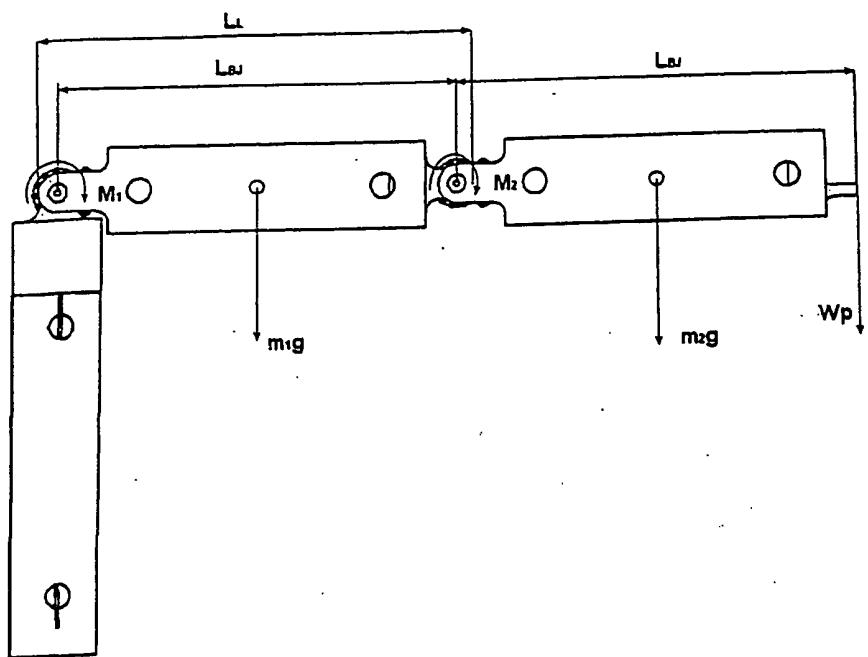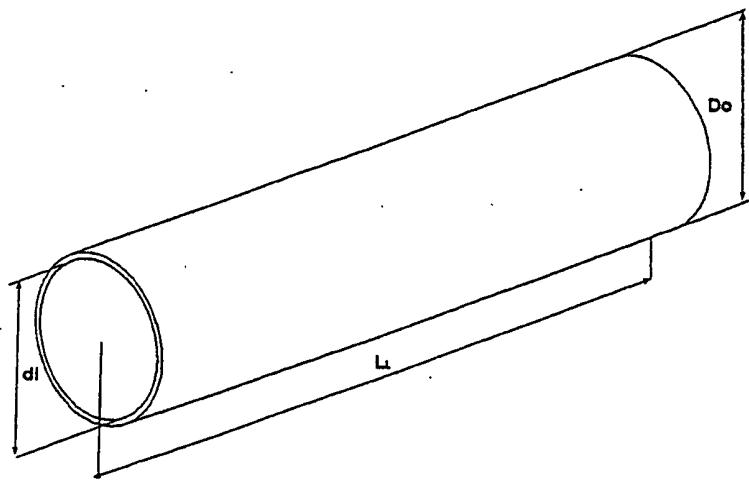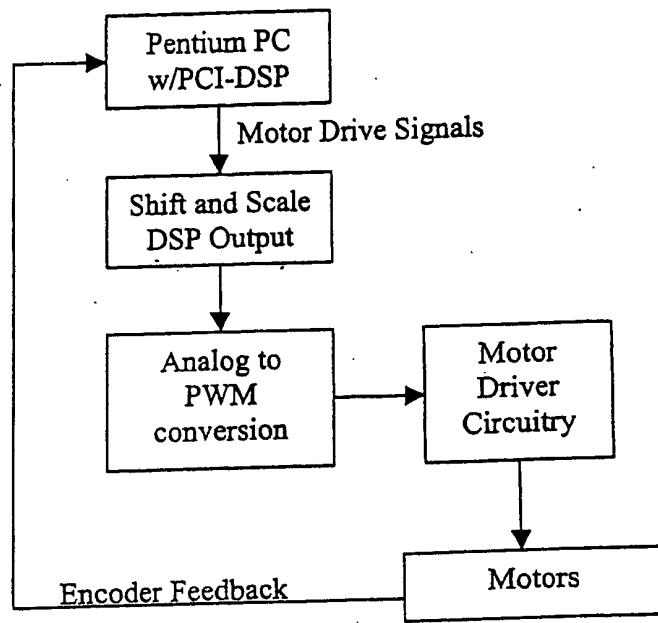
Figure 18

Figure 19A

Figure 19B

```
                    ┌─────────────┐
                    │  Sample ADC │
                    │  (Provided) │
                    └──────┬──────┘
                           │
                           ▼
                        ◇ Third Sample? ◇ ──────────────┐
                           │                            │
                          Yes                           │
                           ▼                            │
                    ┌─────────────┐                     │
                    │Select Correct Axis│               │
                    └──────┬──────┘                     │
                           │                            │
                           ▼                            │
                    ┌─────────────┐                     │
                    │ Update PWM  │                     │
                    │ Pulse Width │                    No
                    │  Register   │                     │
                    └──────┬──────┘                     │
                           │                            │
                           ▼                            │
                    ┌─────────────┐                     │
                    │Update Direction│                  │
                    │     Bit     │                     │
                    └──────┬──────┘                     │
                           │                            │
                           ▼                            │
                    ┌─────────────┐                     │
                    │ Change Input│                     │
                    │Analog Multiplexer│                │
                    │to Next Axis Input│                │
                    └──────┬──────┘                     │
                           │                            │
                           ▼                            │
                    ┌─────────────┐                     │
                    │             │                     │
                    │    Exit     │◄────────────────────┘
                    │             │
                    └─────────────┘
```
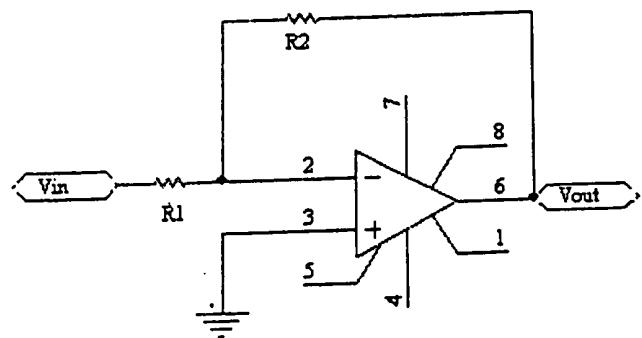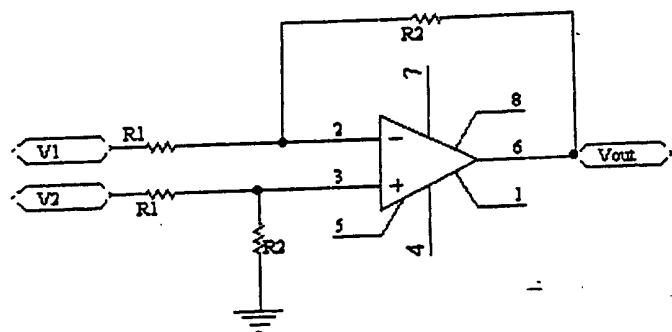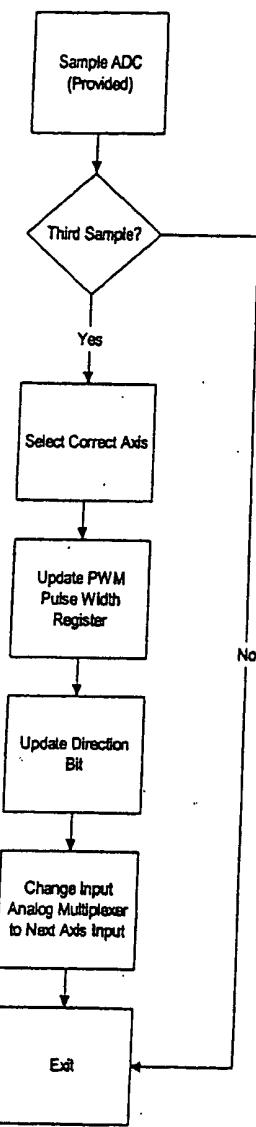
Figure 20

Figure 21

Figure 22

Impulse response on Axis 1

23A

Impulse response for axis 2

23B

Impulse response on axis 3

23C

Approximation to impuls   on axis 1

2AA

Approximation to impulse on axis 2

24B

Approximate to impulse response on axis 3

24C

Figure 25

x denotes the location of system poles.

This system can be optimized only a little more. When the system is optimized, these three poles will be aligned
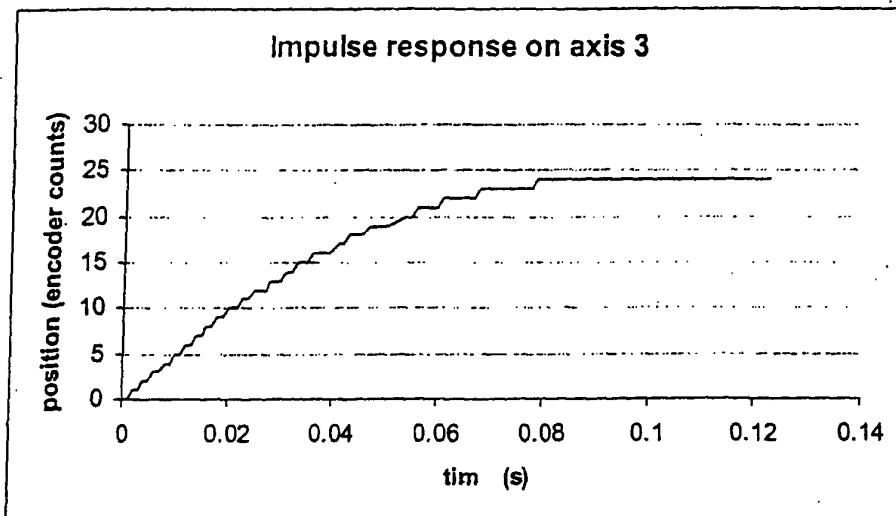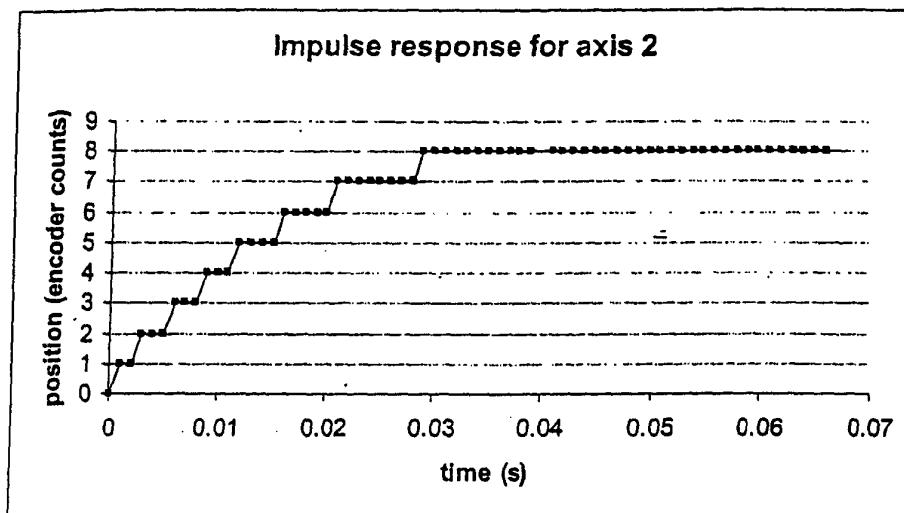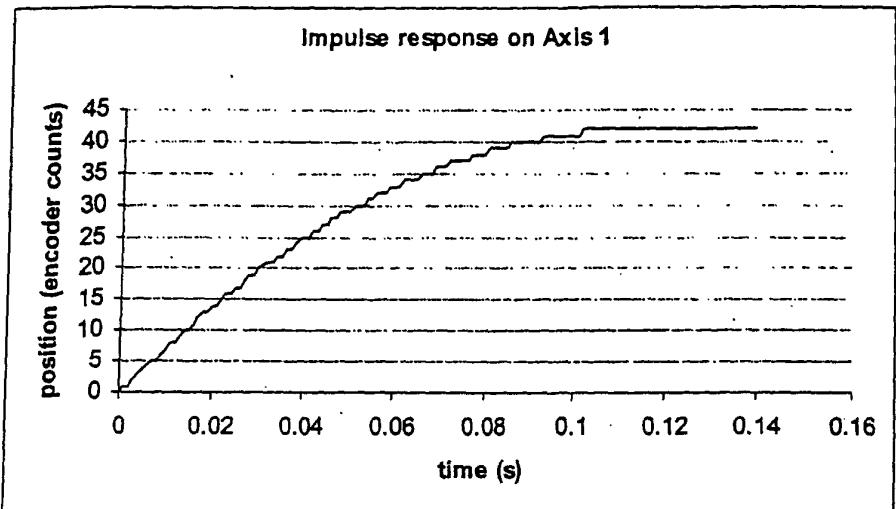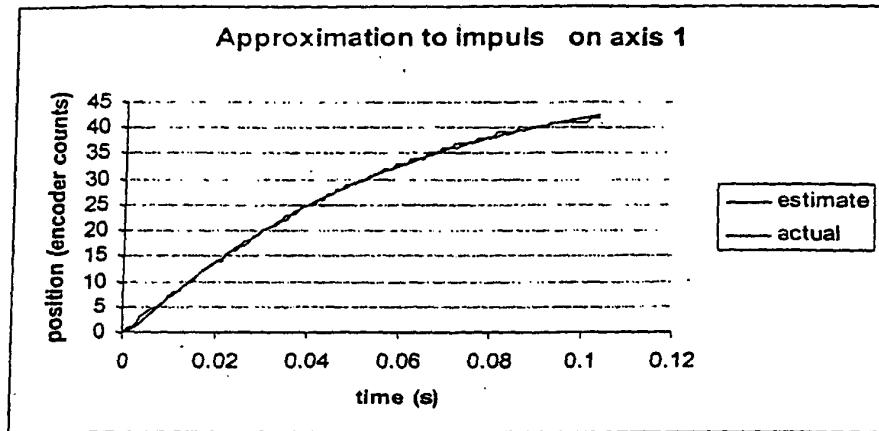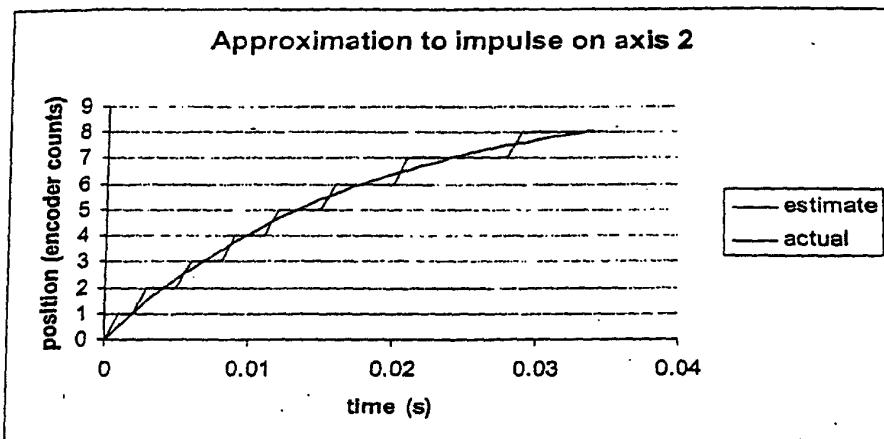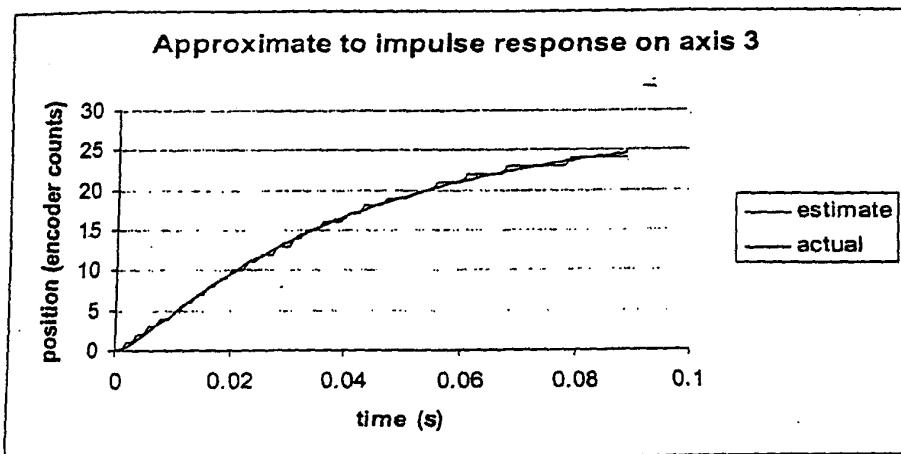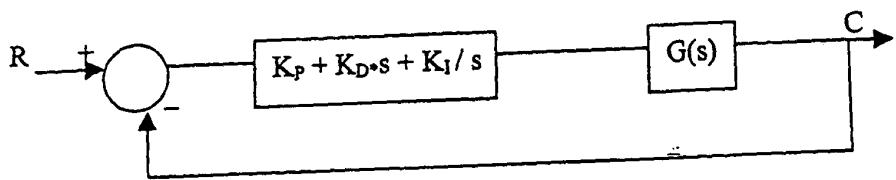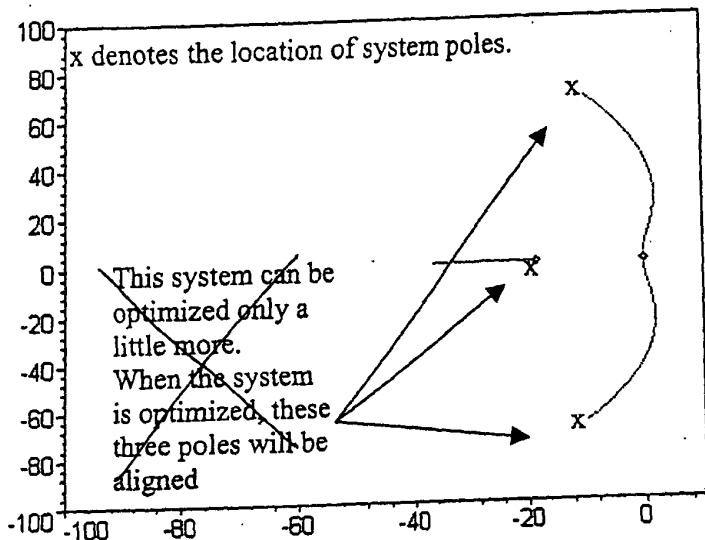
26A
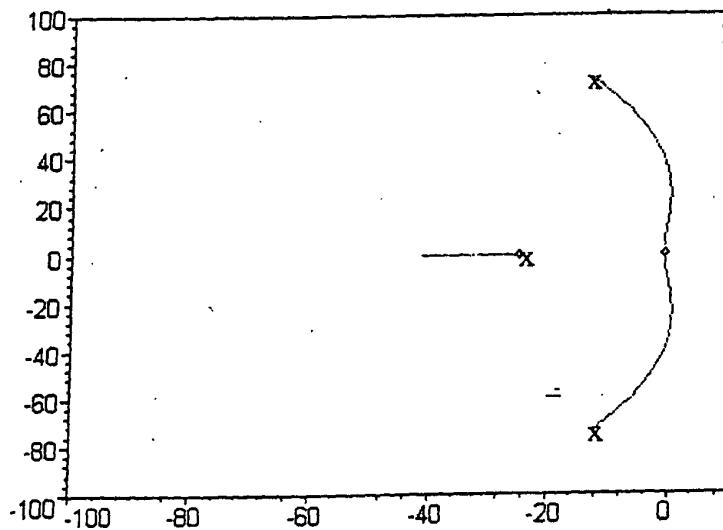
26B
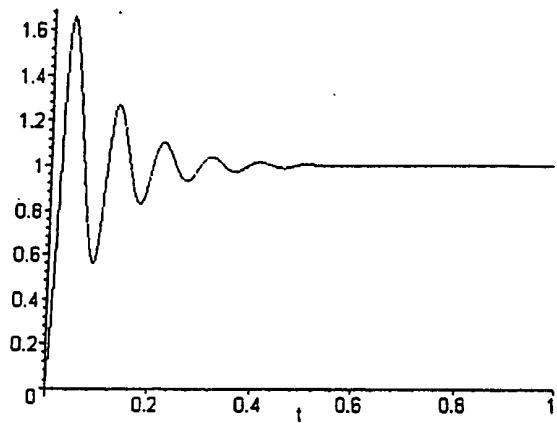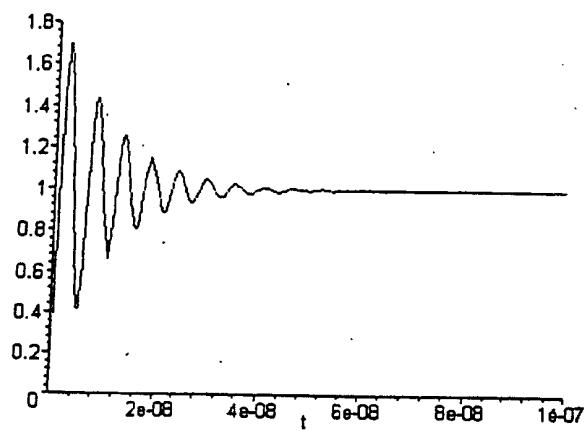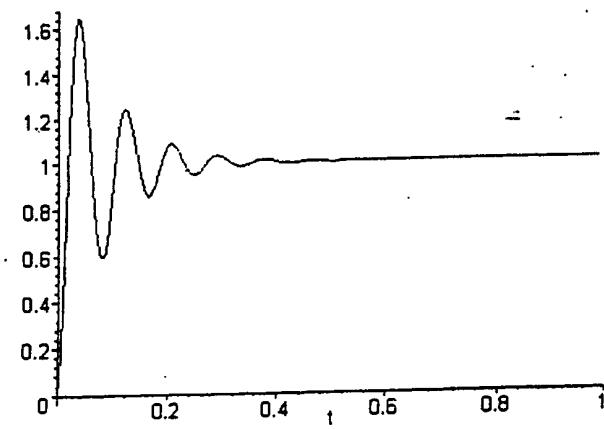
Fig 27A

Fig 27B

Fig 27C
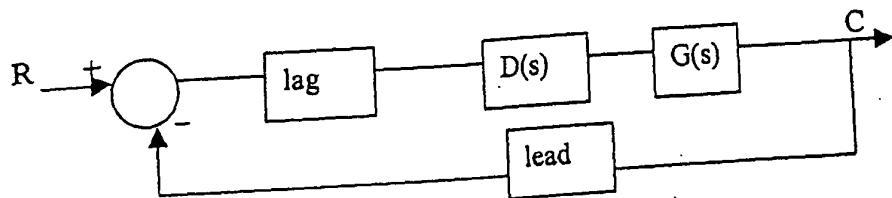
Fig 28
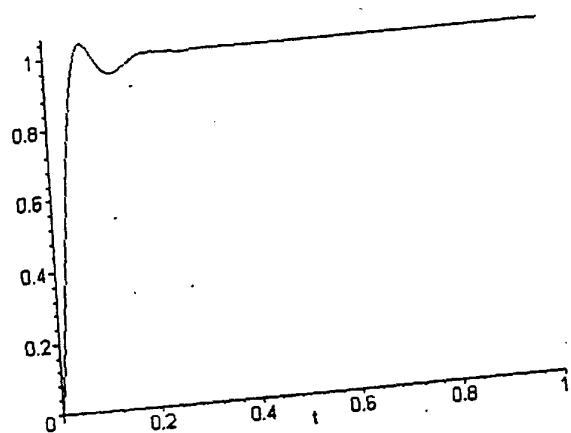
Fig 29A
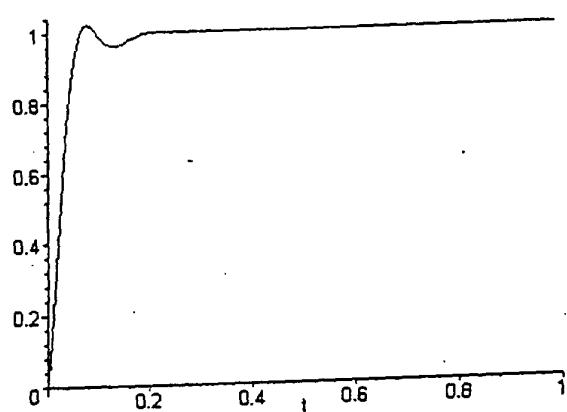
Fig 29B

Fig 30

Fig 31

Fig 32